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Notes on Amphisbaenids (Amphisbaenia, Reptilia). 5 A Redefinition and a Bibliography of *Amphisbaena alba* Linné

By Carl Gans[1]

INTRODUCTION

Amphisbaena fuliginosa and *A. alba* (both of Linné, 1758) are the oldest of the 50 odd names for South American species of *Amphisbaena*. The species involved are among the largest, and certainly have the widest distribution, of any amphisbaenid. Nevertheless, it was only recently that Vanzolini (1951, 1955) confirmed the fact that they are distinct, and furnished a synonymy and a very interesting summary of variation for *A. fuliginosa*. Unfortunately he restricted himself to an analysis of variation for the Brazilian records of *A. alba*, so that one must return to Boulenger (1885, p. 438) for a diagnosis and synonymy of this species.

The present notes are intended to bring this story up to date. They emphasize certain previously overlooked, diagnostic characteristics of *A. alba*, present a revised synonymy and a brief diagnosis and review of the literature and a number of museum records for an estimate of the species range. Reference has also been provided to sources of morphological and ecological data. The problem of intraspecific variation is left

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to subsequent workers, and the literature citations are presented primarily for their convenience. It is quite possible that some of the assignments are erroneous.

I am indebted to the National Science Foundation for grant NSF G-9054 which enables me to pursue these studies. Work under a John Simon Guggenheim Memorial Fellowship, awarded in 1953–1954, allowed me to gather some preliminary data. Travel to Europe in the summer of 1960 was supported by a gift from the estate of Leo Leeser. I am grateful to Mr. W. C. A. Bokermann for the gift of some specimens and to Dr. J. A. Peters for the use of his notes on the fauna of Ecuador. Special thanks are due to the librarian and staff of the British Museum (Natural History) for their extraordinary courtesy.

Specimens examined by me are cited under Locality Records. Other records (preceded by an asterisk) are listed on the authority of the respective curator. The materials are deposited in the following institutions and have been made available through the cooperation of their professional staffs:

A.M.N.H., the American Museum of Natural History (C. M. Bogert and M. Schmied)
A.N.S.P., Academy of Natural Sciences of Philadelphia (J. Böhlke)
B.M., British Museum (Natural History), London (J. C. Battersby and A. G. C. Grandison)
C.A.S., California Academy of Sciences, San Francisco (A. Leviton)
C.G., Gans collection, University of Buffalo, New York
C.M., Carnegie Museum, Pittsburgh, Pennsylvania (N. D. Richmond)
C.N.H.M., Chicago Natural History Museum, Illinois (R. F. Inger and H. Marx)
H.U.J., Hebrew University, Jerusalem, Israel (G. Haas and Y. Werner)
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M.C.Z., Museum of Comparative Zoölogy at Harvard College, Cambridge (E. E. Williams)
M.G.S., Museum de Genève, Switzerland (V. Aellen)
M.H.N.P., Muséum National d'Histoire Naturelle, Paris (J. Guibé)
M.S.N.G., Museo Civico de Storia Naturale "Giacomo Doria," Genoa (L. Capocaccia)
R.M.N.H., Rijksmuseum van Natuurlijke Historie, Leiden (M. Boeseman and H. E. Muller)
S.U., Stanford University, Museum of Natural History, Stanford, California (C. Myers and M. Storey)

U.M.M.Z., University of Michigan, Museum of Zoology, Ann Arbor (T. M. Uzzell and C. Hartweg)
U.S.N.M., United States National Museum, Washington, D. C. (D. M. Cochran)
V.M., Naturhistorisches Museum, Vienna (J. Eiselt)
Z.S.M., Zoologische Sammlung des Bayerischen Staates, Munich (W. Hellmich)

CAUDAL AUTOTOMY

The first previously ignored characteristic is caudal autotomy. This is quite common among the species of *Amphisbaena* and indeed among amphisbaenids in general (Vanzolini, 1948, 1951, MS). It characteristically occurs at a single level, some four to eight segments posterior to

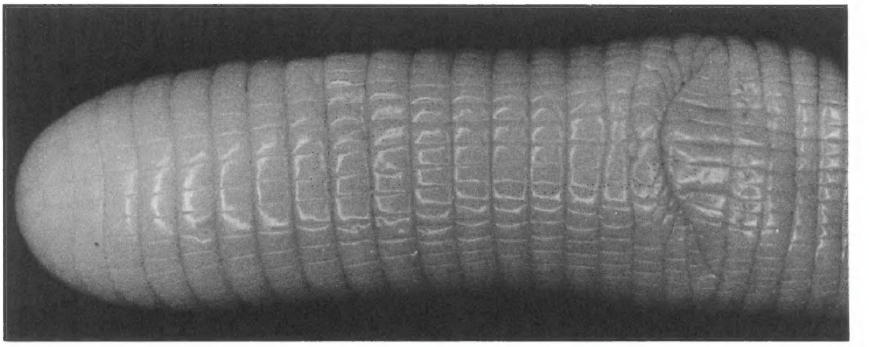

FIG. 1. *Amphisbaena alba.* Ventral view of cloaca and tail of B.M. No. 1920.-1.20.1298 from Cayenne. Note absence of autotomy constriction and bluntly rounded terminal tip.

the cloaca. The level is characterized by an intravertebral fracture plane and can generally be noted externally by a narrowed and constricted annulus. The broken end heals with some minor bone formation around the fracture surface, but there is no regeneration (personal observation).

Amphisbaena alba is among the few species of the genus in which caudal autotomy is lacking. The vertebrae show no fracture plane, and the caudal annuli are of approximately equal width from cloaca to caudal tip (fig. 1). None of the 90 specimens for which Vanzolini (1955) cites data had an autotomized tip, and I observed none during a cursory examination of some 200 additional specimens in various museums. *Amphisbaena alba* is, therefore, the only large species in the genus to lack an autotomy plane, and the lack is an excellent character for a rapid discrimination of specimens.

Many individuals have prominent scars from more or less severe

wounds on the tail, and some have a section or piece of tail missing, presumably having been bitten out. Such injuries are not surprising, as *A. alba* engages in a defensive behavior in which the head and tail are lifted vertically at right angles to the body which swings from left to right into opposed semicircles (Beebe,[1] 1945, p. 28; Fonseca, 1949, fig. 4). Though the mouth gapes widely and the animal can deliver an effective bite (Bateman, 1897, p. 149; Gans, personal observation), it is difficult to distinguish the head from the tail. The tail remains in an elevated position when the anterior end of the animal begins to burrow. Renewal of the stimulation increases the strength of the response. The angle between the caudal tip and the horizontal approaches 90 degrees, and the tip may strike to left or right. It seems to focus the attention of the (human) observer and probably has a similar effect on those predators that may occasionally surprise the species in the open. It must also be remarked that the caudal tip appears unusually solid, with the skin rigidly adhering to the vertebral column by multiple connections. Even large and heavy specimens of *A. alba* can be picked up by the caudal tip, even dragged backward out of their burrows by it, without fracturing the tail.

COLORATION OF JUVENILES

The coloration of *A. alba* has been referred to as uniform since Linné's (1758, p. 229) diagnosis: "Alba tota." Specimens are known to be darker on the dorsal than on the ventral surface, and various differences in color have been described (*vida infra*), but no references to a mottled pattern have occurred in the literature. Some specimens might have been misidentified as *A. fuliginosa*, but the literature review has produced no indication of such misidentification.

The American Museum collection contains an unidentified, blunt-nosed amphisbaenid with a distinctly blotched pattern on the dorsal surface (fig. 2). The individual (A.M.N.H. No. 21279 from Kartabo, British Guiana) is quite small, measuring 170 mm. along the body (which is broken into three pieces) and 14.5 mm. along the tail. The high number of segments to a midbody annulus (34 dorsal plus 42 ventral), the absence of a caudal autotomy constriction, the low number of caudal annuli (15), and the body proportions rule out its assignment to *A. fuliginosa*. These and all other characters suggest assignment to *A. alba*.

The American Museum specimen is considerably smaller than the

[1] In spite of this author's statement, I have never seen the "small dark spot simulating the eye" on the tail of preserved or living specimens.

smallest individual cited by Vanzolini (I.B. No. 554 from Cana Brava, Goiaz, Brazil) which had a body-plus-tail length of 215+16 mm. A reëxamination of many specimens disclosed three other records of juveniles with a blotched dorsal surface. These were a 204+19-mm. specimen from Cayenne (B.M. No. 1920.1.20.1298; see fig. 3), a 247+21-mm. specimen from Trinidad (U.S.N.M. No. 5788), and a faintly mottled 327+32-mm. specimen from Surinam (R.M.N.H. No. 7558). The absence of pattern in the few specimens of comparative size seen from

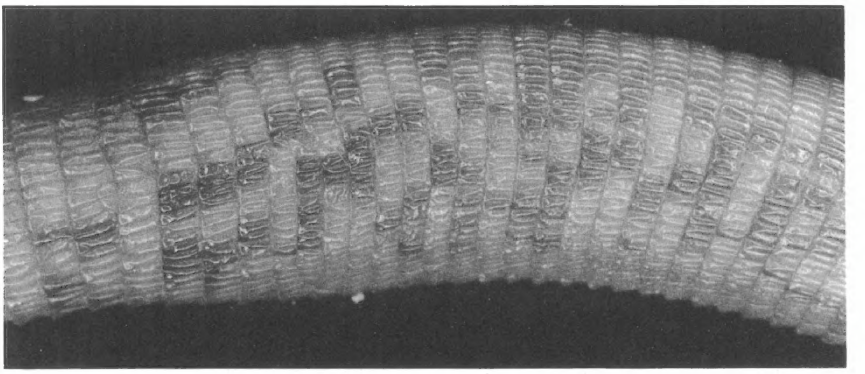

FIG. 2. *Amphisbaena alba.* Dorsal view of hatchling specimen (A.M.N.H. No. 21279 from Kartabo, British Guiana) on posterior third of trunk. Note blotched pattern, the high width to length ratio of dorsal segments, and the wrinkling of the epidermis, all characteristic of hatchlings.

other areas suggests geographic variation. The matter merits further study, but it seems clear that a color pattern is found in juveniles of at least some populations of this species.

DISCUSSION OF SYNONYMY

A survey revealed seven names for *A. alba.* Of these, three were considered synonyms, and one a full species, by Boulenger (1885, p. 438). The three others, one manuscript name and two varietal names, were omitted by him and have not been noted since. In determining the status of described varieties, I have relied primarily on the variational study of Vanzolini (1955) who found no trends to justify the erection of subspecies in his Brazilian material. Forms of which the variation (in the characters used by him or emphasized in the descriptions) was within the described limits have been considered synonyms. Several of these

names would be available if future study demonstrates geographical variants.

The name *alba* (Linné, 1758) was based on two specimens from "America." The syntypes are now in the Drottningholm Museum (Andersson, 1899, p. 7).

The name *rosea* was used by Shaw and Nodder (1791, pl. 86) for a variety which "sometimes . . . occurs of a beautiful rose-color." They did not designate a type, and the name represents a strict synonym of *A. alba.*

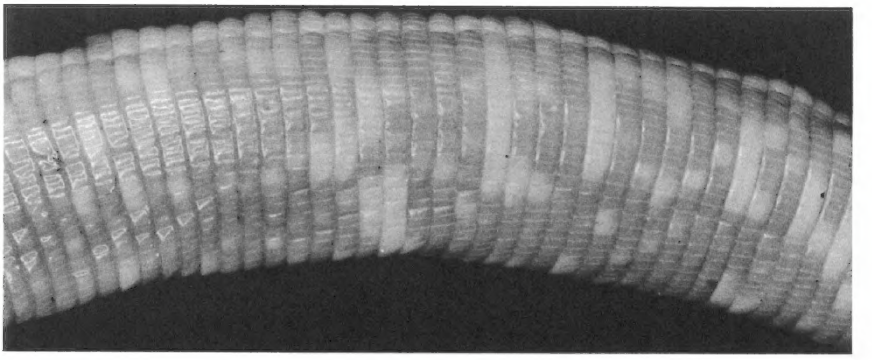

FIG. 3. *Amphisbaena alba.* Dorsal view of 204+19-mm. specimen (B.M. No. 1920.1.20.1298 from Cayenne) to show midbody color pattern.

In an 1822 catalogue Wolf (pp. 61–63, pl. 17) added two names for specimens that were brownish rather than white. He published Wagler's manuscript name *exalbida,* set it aside as "*nicht bezeichnend genug*" (insufficiently characteristic), and based the new name *pachyura* on the same individual. He neither named a type nor gave the locality of material examined. The names are strict synonyms of *A. alba.*

In 1825 Wied (1825a) described and illustrated *A. flavescens* from specimens collected in "*Bahía, Belmonte, . . . grossen Waldungen am Flusse Mucurí.*" The same year (1825b, p. 507) he gave the range as "*Sertong von Bahía und in der Gegend des Flusses Belmonte, so wie des Mucurí.*" The new form was supposed to differ from *alba* by its retention of color. Wagler (1833, pl. 16) who figured what may have been a type also mentions that it differed from *A. alba* by having six instead of nine pores.

The American Museum of Natural History contains only a single specimen of *A. alba* that is both attributed to Wied and has six precloacal pores. The individual is labeled "*A. flavescens* Wied" on a paper tag of

the American Museum of Natural History, but there is no other indication that it is one of the two specimens mentioned by Wied (1825b). The specimen is in good agreement with the original figures and description, and I here designate A.M.N.H. No. 1098 the lectotype. The second specimen of the original pair of syntypes must be presumed lost, unless Wied meant the count of six precloacal pores to apply to only one of the two, in which case A.M.N.H. No. 1097 is the paratype.

Bokermann, in his itinerary of the Wied expedition (1957, pp. 224, 227–228), lists the Belmonte and Mucurí rivers as his numbers 128 and 81.

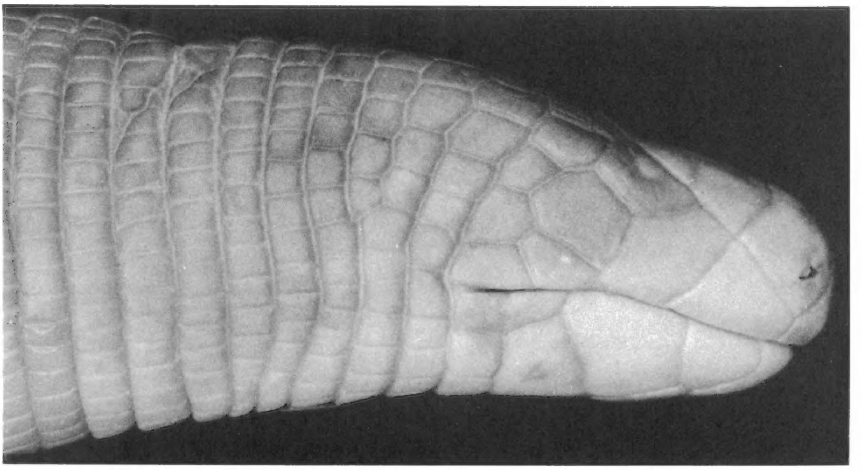

FIG. 4. *Amphisbaena alba.* Lateral view of the head of A.N.S.P. No. 11343 (holotype of *A. beniensis*) to show the split third supralabial.

Since Wied collected at a number of points along the Belmonte River, but at only a single point along the Mucurí, I here restrict the type locality to the "mouth of the Mucurí River."

In 1885 Cope (p. 184, fig. 2a–d) gave the name *beniënsis* to a specimen collected by Edwin R. Heath on the "Upper Beni river in Bolivia." He gave a detailed description of the head scalation, mentioned 16 caudal annuli, six precloacal pores, and a body-plus-tail length of 310+25 mm. Neither the number of body annuli nor the number of segments to an annulus was given, and Cope placed the species in the "group to which *A. pretrei*, *A. vermicularis*, *A. angustifrons* and *A. occidentalis* belong." In his key to the species of *Amphisbaena*, he emphasized the presence of a suborbital plate (= third supralabial split), and the fact that the symphyseal (= mental) was wider than long, or longer than wide. He may well

have relied on Strauch's erroneous (1881, col. 61) statement that *A. alba* never had suboculars.

The name was referred to in passing some half dozen times, no additional specimens were reported on, the type was never reëxamined, and Amaral (1937a, p. 198) even went so far as to include the form in the synonymy of "*A. petrei*" (= *A. pretrei*). The holotype of *beniënsis* (A.N.S.P. No. 11343) has 237 body, four lateral, and 14 caudal annuli; 31 dorsal and 35 ventral segments to a midbody annulus; six precloacal pores; a body-plus-tail length of 312+25 mm.; and lacks a caudal autotomy plane. The split third supralabial occurs in some specimens of *A. alba*. The general

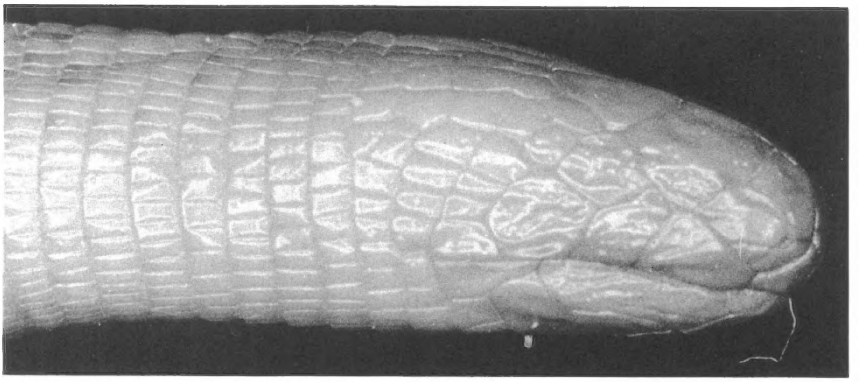

FIG. 5. *Amphisbaena alba*. Lateral view of the head of A.M.N.H. No. 21279 from Kartabo, British Guiana. Note the rounded outline of the juvenile head, in contrast to the swollen snout and bulging temporal musculature indicated by the adult in figure 6.

similarity of scalation can be confirmed by a comparison of figure 4 with figure 6 (middle). The data of the specimen are also in good agreement with those of Vanzolini's small sample of *A. alba* from western Mato Grosso (1955, p. 689). There can thus be little doubt that the name is a synonym of *A. alba*.

Cope also described the varieties *radiata* and *dissecta* in the plate caption of his 1885 paper, but neither name has received mention in subsequent lists or papers.

The description of *radiata* reads: "Caudal annuli 18; of the body 236; preanal plates 12; pores 8. Uniform white. Habitat unknown. One specimen." Cope's figure 7 shows a diagrammatic view of the chin segments. The pattern is distinct from the "normal" *A. alba* pattern (Cope, 1885, fig. 6, based on three specimens) in that the second infralabials,

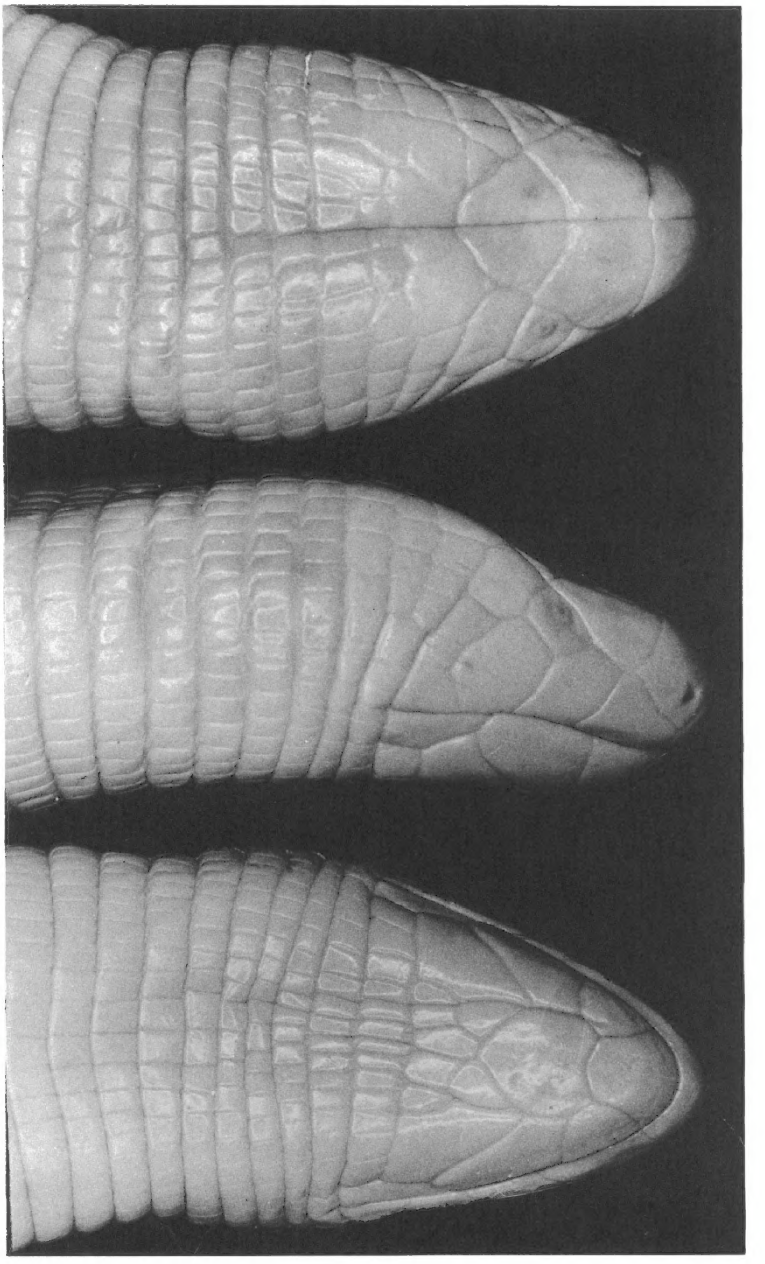

FIG. 6. *Amphisbaena alba. Top to bottom:* Dorsal, lateral, and ventral views of the head of B.M. No. 1920.1.20.1299 from Cayenne.

malars, and postgenials are triangular, with their pointed apices in contact with the tear-shaped postmental. The "normal" pattern is supposed to consist of approximately rectangular malars and postmental, two rows of postgenials, and one row of postmalars. The type of *radiata* appears to have been lost, and the chin-shield pattern seems well within the variational range of the very variable *A. alba*.

The description of *dissecta* reads: "Annuli to vent 226; of tail 18; preanal plates 12; pores 8. Brownish above, below white. Venezuela. One specimen." Cope's figure 8 (1885) shows highly idealized dorsal, lateral, and ventral views of the head which do not quite match. The name and figure suggest that Cope was impressed by the breakup of the malars into a series of small segments. The counts for the holotype (A.N.S.P. No. 9693) agree with those given in the description, except that there are three lateral and 17 caudal annuli. None of the characters suggests that this is a valid race.

Amphisbaena alba Linné

Amphisbaena alba Linné, 1758, p. 229. Terra typica: "America." Syntypes: Museum Drottningholm (two examples per Andersson, 1899, p. 7).

Amphisbaena rosea Shaw and Nodder, 1791 (cf. Sherborn, 1895, p. 375), pl. 86, and text. Terra typica: "America." Type not designated.

Amphisbaena pachyura Wolf, 1822, p. 61. Terra typica: Not designated. Type lost.

Amphisbaena exalbida Wagler, *in* Wolf, 1822, p. 62. Manuscript name for type of *A. pachyura*.

Amphisbaena flavescens Wied, 1825a (cf. Isis von Oken, vol. 17, p. 922), Heft 9. Terra typica: "*Bahía, Belmonte, . . . grossen Waldungen am Flusse Mucurí*," Brazil. Here restricted to "mouth of Mucurí River." Lectotype: A.M.N.H. No. 1098, by present designation.

Amphisbaena beniënsis Cope, 1885, p. 184. Terra typica: "Upper Beni River, Bolivia." Holotype: A.N.S.P. No. 11343.

Amphisbaena alba var. *radiata* Cope, 1885, p. 194. Terra typica: "Unknown." Type lost.

Amphisbaena alba var. *dissecta* Cope, 1885, p. 194. Terra typica: "Venezuela." Holotype: A.N.S.P. No. 9693.

Diagnosis: A large, blunt-nosed form of *Amphisbaena* without fusion of head segments, unicolored when adult, with a high number of segments to a midbody annulus, and lacking a caudal autotomy constriction. Specimens have 198 to 248 body annuli; 13 to 21 caudal annuli; 65 to 85 (30–42 dorsal; 35–46 ventral) segments per midbody annulus; and four to 10 precloacal pores.

Description: Meristic data for Brazilian specimens are cited from Vanzolini (1955). Counts by me on non-Brazilian specimens fall within

these ranges. Figures 4 through 6 show views of heads of juvenile and adult; figures 2 and 3, the juvenile color pattern; and figures 1 and 7, the ventral surfaces of cloaca and tail.

Preserved specimens are a uniform yellow-tan, brown, or brownish pink dorsally and slightly lighter ventrally. Juveniles may have a dorsal pattern of irregular darker spots (figs. 2, 3). There is no tendency toward darkening of the segmental centers. For a colored photograph of a live specimen, see Schmidt and Inger (1957, fig. 57).

FIG. 7. *Amphisbaena alba.* Ventral view of cloaca of Z.S.M. No. 217/1933 from San Bernardino, Paraguay. Note the way in which almost all sutures enter the cloacal slit in parallel from the sides.

The head scalation shows considerable variability and is often asymmetrical (cf. Brongersma, 1932). The description (following Gans and Alexander, MS) is hence of the general pattern, almost all elements of which have been observed to vary in one specimen or another.

An azygous rostral is followed by three pairs of enlarged cephalic shields in contact along the dorsal midline, with the nostrils pierced in the first pair (nasals). The second pair (prefrontals) are the largest segments of the head. There are four supralabials and three infralabials. The first three supralabials are large, and particularly the third one may be split in some individuals (fig. 4). The first two pairs of infralabials are large. The third is narrow and generally widest at its posterior end. There is a single row of temporal (postocular) segments, varying in number, and lying between the fourth supralabial and the frontal. The T-shaped mental is followed by a slightly larger, heart-shaped postmental,

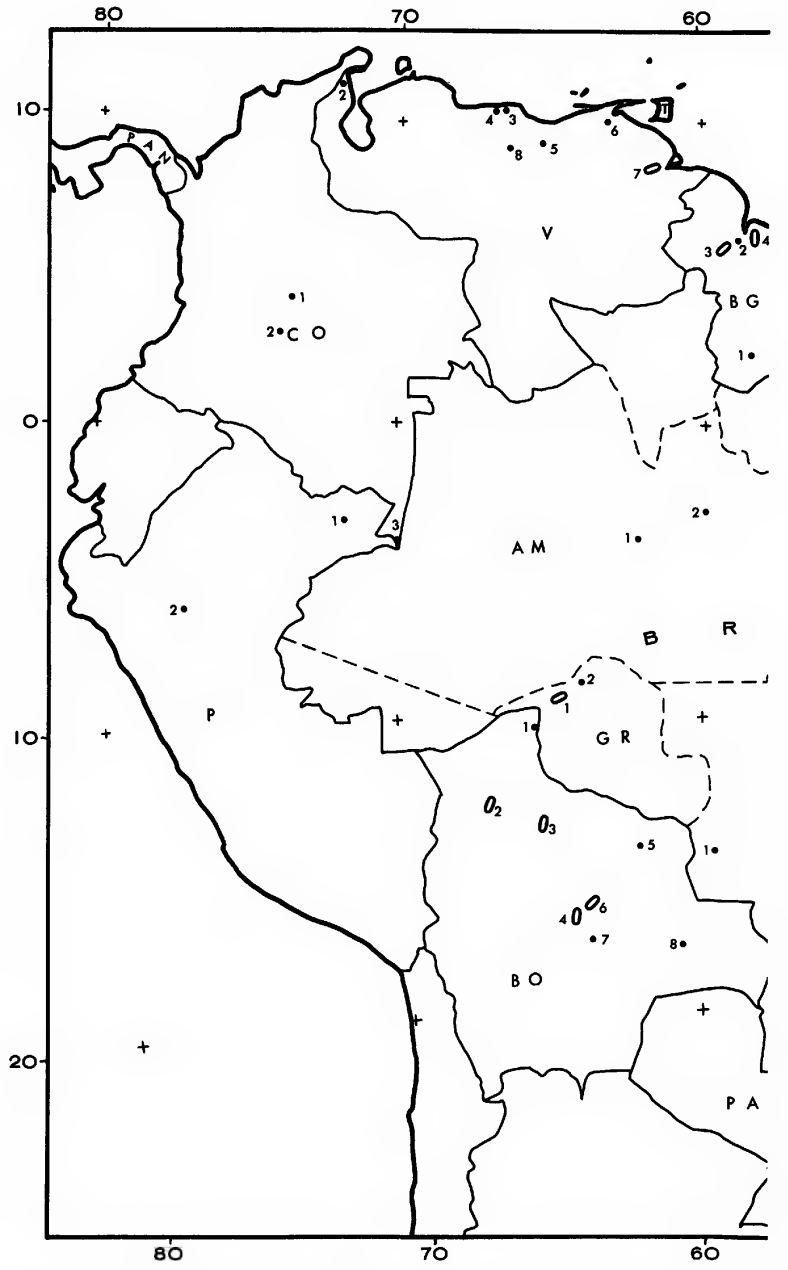

FIG. 8 (THIS AND OPPOSITE PAGE). Map of localities from which *Amphisbaena alba* has been recorded. Solid circles refer to sites; open ovals, to general regions (i.e., "Headwaters of Rio Mamore"). The code is explained in text under Literature Records. See figure 9 for localities within the state of São Paulo, Brazil.

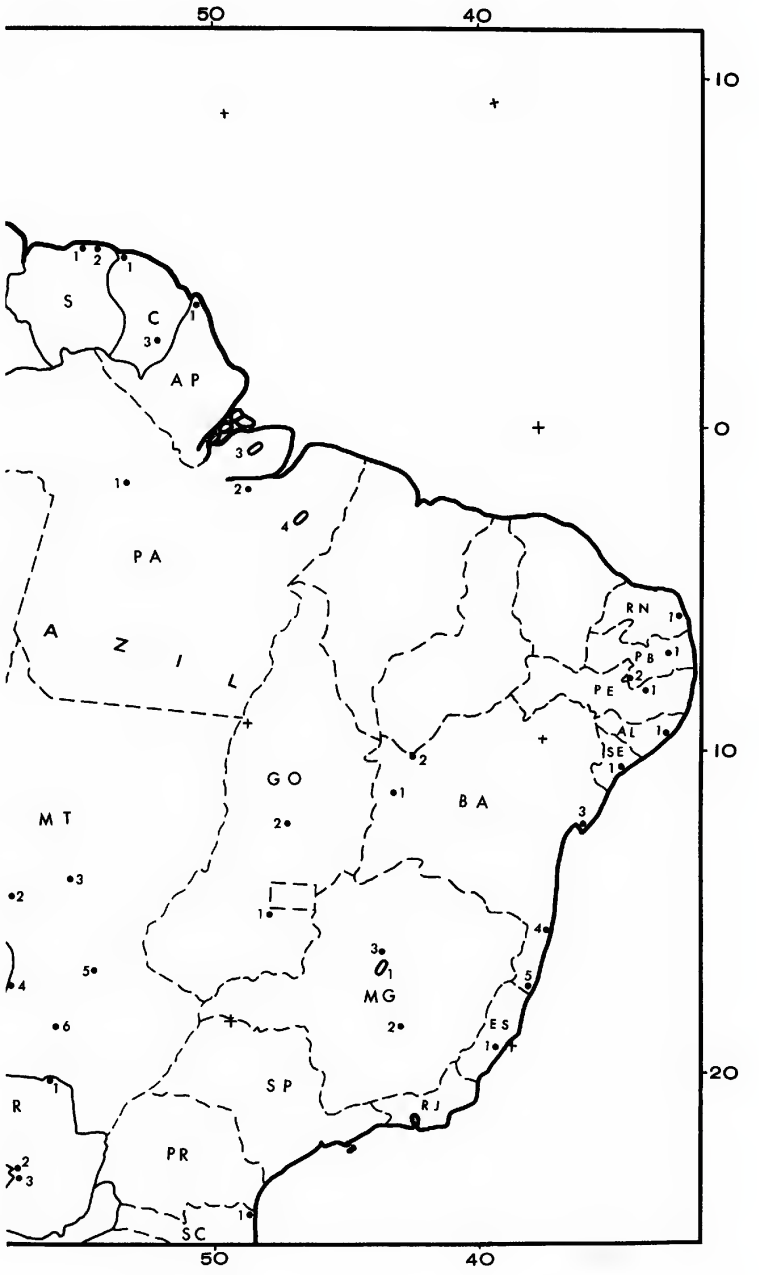

FIG. 8. (For caption, see opposite page).

often in point contact posterolaterally with a pair of large malars. There are normally two segments in the first postgenial, and two to three in the second postgenial, row. The number of the latter may be increased to five or more by a splitting off of the posteromedial corners of the malars. There is a row of from 12 to 15 postmalars.

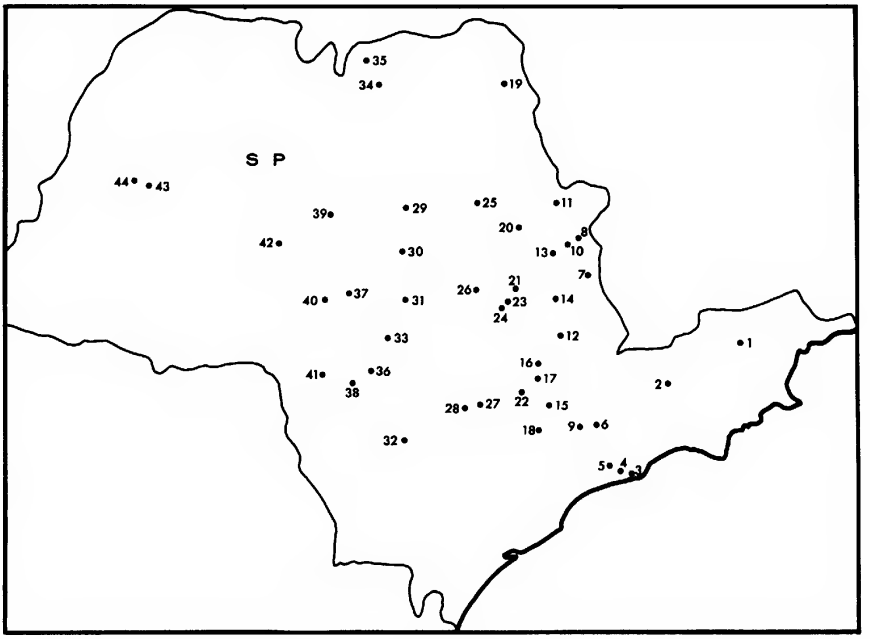

FIG. 9. Map of localities in the state of São Paulo, Brazil, from which *Amphisbaena alba* has been recorded. The numbering is explained in the text under Literature Records.

The snout is blunt, flattened slightly dorsoventrally, and oval in cross section. The upper jaw projects beyond the lower which inserts between the projecting supralabials. The shape of the head is strongly affected by the allometric growth pattern of the temporal musculature (contrast fig. 5 and fig. 6, middle view). The skin bulges away from the skull in the temporal region to an extent sufficient to produce a convex curvature just posterior to the eyes. The middorsal line is more closely attached to the parietal crest of the supraoccipital, so that adults also show a depression between the bulging temporal muscles.

One to two dorsal half-annuli insert after the first or second body annulus. The first six to eight annuli are narrowed, and the sixth annulus

generally marks the level of the head joint, which is apparent by a noticeable but not conspicuous constriction.

The dorsal grooves are poorly defined except on the head and tail. The ventral groove is indicated mainly as a gap between aligned segments. The lateral grooves are well defined, starting gradually after the first fifth of the body. They are often crossed with diagonal fold lines that seem to facilitate adjustment of the skin when the body is twisted. The dorsal segments are much narrower than long; the ventral ones are square at midbody.

The precloacal pores lie in a single uninterrupted row of normal-sized or slightly wider segments anterior to the precloacal shield. The precloacals generally number more than 10 elongate, parallel-sided segments. The postcloacals, slightly greater in number, are characterized by a central group of two to four enlarged segments, flanked on each side by a group of very narrow segments, the deep sutures between which enter the cloaca laterally as a series of parallel cross lines. The cloaca may be entirely prolapsed.

The tail is of constant diameter up to the blunt end, which is capped by a group of segments with decreased intersegmental differentiation.

HABITS: Most of the comments relating to this topic do not state clearly whether the authors are reporting original observations or repeating statements from the literature. A number of the tales, such as reports of cooperation between *A. alba* and *A. fuliginosa* and ants of various species, seem to have come down virtually unchanged from their initial mention by Soares de Souza (1587). Specimens have been found in dead trees or in ground only a few centimeters deep (Aleman, 1952), and beneath forest debris down 1 to 2 feet in the ground (Beebe, 1945). They are said to come up during heavy rains (Beebe, 1945).

The food has been reported as consisting of earthworms, slugs, insect larvae, smooth caterpillars, mole crickets, grasshoppers, termites, millipedes, and raw meat (Bateman, 1897; Beebe, 1945; Engmann, 1926). I have fed amphisbaenids with earthworms and crickets. Nothing is known of their breeding or egg-laying behavior in spite of survival in captivity up to 21 months (Flower, 1925).

ANATOMY: General discussions: Cuvier (1817), Stannius (1856), and Wagner (1843).

Situs viscerum: Beebe (1945), Cope (1896, hepatic mesenteries; 1900), Gorham and Ivy (1938, gall bladder). Lungs: Butler (1895), Milani (1894). Visceral circulation, Hochstetter (1898), Rathke (1857, 1863).

General skeleton: Cope (1892a, 1892b). Vertebrae: Gilmore (1928), Williston (1918, 1925).

Skull and mandible: Broili (1908), Brühl (1886), Camp (1923), Cuvier (1829–1830, vol. 3), Gilmore (1928), Jollie (1960), Lakjer (1927, palate), McDowell and Bogert (1954), Romer (1956), Underwood (1957), Vanzolini (MS), Williston (1918, 1925). Hyoid: Cope (1900), Fürbringer (1919, 1922). Teeth: Owen (1840–1845). Tooth replacement: Gans (1957).

Cranial nerves: Bendz (1843), Bischoff (1832), Fischer (1852). Head muscles: Haas (1934), Lakjer (1926, 1927). Tongue: Duméril and Bocourt (1879). Nose: Pratt (1948). Middle ear: Burlet (1934), Camp (1923), Gans (1960), Versluys (1898, mostly *A. fuliginosa*).

Trunk muscles: Camp (1923). Shoulder girdle: Fürbringer (1900), W. K. Parker (1868), Rathke (1853). Pelvic girdle: Mayer (1826, 1829), Wagler (1841, 1843).

RANGE: Forested lowlands of South America, from Panama(?) through Venezuela, Trinidad, and the Guianas; Colombia, Peru, and Bolivia east of the Andes; Brazil and northern Paraguay.

LOCALITY RECORDS: For maps, see figures 8 and 9. An asterisk (*) preceding the specimen number indicates that the specimen was not examined by me; a question mark before a locality, that it could not be found or that several localities exist with the same name. The name of each country, or state in the case of Brazil, and that of each locality within it are followed in parentheses by an abbreviation and a number, respectively, which should facilitate the locating of points on the maps.

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PANAMA (PAN): M.N.H.P. No. 86-294.

VENEZUELA (V): Cope (1885); A.M.N.H. No. 1094; A.N.S.P. No. 9693 (holotype of var. *dissecta*); U.S.N.M. No. 58740. Cocollar (1), Schmidt (1932); C.N.H.M. No. 17802. Angostura (2), Strauch (1881). Calabozo (3), Strauch (1881). Caracas (4), Strauch (1881); S.M.F. No. 11799. Zaraza, Estado de

Guarico (5), Roze (1952). Caripito (6), Beebe (1945); A.M.N.H. No. 57346. Orénoque (7), M.H.N.P. No. 87-179. Baruta (8), Aleman (1952). Espino, Guárico (250 meters), *M.B.U.C.V. Nos. 3708, 3709. Las Delicias, Maracay (400 meters), *M.B.U.C.V. [The last two records were received too late to be entered on the map.]

Trinidad (T): Burt and Burt (1930, 1931), Mole (1894), H. W. Parker (1935b), Roux (1926), Strauch (1881); A.M.N.H. Nos. 8747, 9032, 17799, 38367; *B.M. No. 1934.7.5.30; K.M. Nos. 4418, 4419; U.S.N.M. No. 5788. Latitude 10° 37′ N., longitude 61° 13′ W., S.U. No. 12508. Arima Valley, Beebe (1952); U.M.M.Z. No. 83172. St. Amis Valley, Port-of-Spain, M.C.Z. Nos. 9004, 11866. Tacarigua, Brongersma (1957); R.M.N.H. Nos. 9913, 10057. San Rafael, C.N.H.M. No. 49909.

The Guianas: Burt and Burt (1931); A.M.N.H. No. 1095.

British Guiana (BG): *B.M. No. 1961.1610. Kuyuwini River banks (1); A.M.N.H. No. 61223. Kartabo (2), Beebe (1945); A.M.N.H. No. 21279; *U.M.M.Z. No. 65167. Mazaruni (3), H. W. Parker (1935a); *B.M. Nos. 1934.11.1.108–1934.11.1.110. Demerara River (4), *B.M. No. 1929.7.13.1.

Surinam (S): Daudin (1803), Fitzinger (1826), Kappler (1881, 1887), Lampe (1901), Müller (1878), Schinz (1833), Strauch (1881), Van Lidth de Jeude (1898); M.C.Z. No. 32256; R.M.N.H. Nos. 3551, 3557, 7558, 7559; V.M. No. 12324. Paramaribo (1), R.M.N.H. No. 7560; S.M.F. No. 11800. Environs of Charlottenburg (2), R.M.N.H. No. 3558.

Cayenne (C): Duméril and Bibron (1839), Duméril (1851), Müller (1878) Strauch (1881); B.M. Nos. 1920.1.20.1298, 1920.1.20.1299; M.C.Z. No. 5537; M.H.N.P. Nos. 45, 98-1, A3100, 3108, A5476, 89-373. Portal Maroni (1), *M.G.S. Camopí, Haute Yapoc (= Oiapoque) (2), K.M. No. 447.

Colombia (CO): Andean "llanos orientales," Dunn (1944). Alto Llano Oriental, Pope (1956). Villavicencio (1), M.C.Z. No. 21975; *U.M.M.Z. No. 97520. Meta, Serrania de la Macarena, Rio Guapaya (2), C.N.H.M. No. 81314. Leticia (3), C.G. Nos. 1200, 1216, 1811.

Peru (P): A.N.S.P. No. 11296. Pebas (1), Cope (1869), Strauch (1881). Moyobamba (2), Boulenger (1885); *B.M. No. 74.8.4.2–74.8.4.4.

Brazil[1]: Amaral (1937a, 1937d), Boettger (1893), Boulenger (1885), Burt and Burt (1931), Fitzinger (1826), Gray (1844, 1865, 1872, 1873), Griffith and Pidgeon (1831), R. von Ihering (1953), Lichtenstein (1856), Thémido (1945), Vanzolini, (MS); A.M.N.H. No. 1097 (Wied); *B.M. Nos. 22.8.16.1a, RR 1961.-2021; M.C.Z. Nos. 32257, 54299; M.H.N.P. Nos. 7052, 7053; S.M.F. No. 11797; V.M. Nos. 12328-1–12328-10. Amérique Méridionale, Duméril and Bibron (1839), Duméril (1851); M.H.N.P. No. 3106. ?Maldonado, A.M.N.H. No. 56222. *Amazonas* (*AM*): ?Aleixo, Vanzolini (1955); Ayapua (1), *B.M.

[1] The Brazilian localities in general, and in this case particularly the São Paulo records cited by Vanzolini (1955), pose problems. Butantan Institute localities are mostly those of the railway station from which the specimen or specimens were shipped. They were generally located by reference to some edition of the Brazilian railway guide, or "Guia Levi" (Anon., 1954), to the publications of the Instituto Brasileiro de Geografia e Estatística (particularly to their "Vocabulário geografico do Estado de São Paulo"; Anon., 1950), or to the series of maps published by the Servicio Nacional de Febre Amarelo.

No. 1926.4.30.9. Manaus (2), Schmidt (1936), Schmidt and Inger (1951), Vanzolini (1955); A.M.N.H. Nos. 64883–64885; *B.M. No. 99.9.5.2; C.A.S. No. 48825; C.N.H.M. No. 64423; S.M.F. No. 11798. *Guaporé* (*GR*): Rio Madeira (1), A.M.N.H. No. 56615. Pôrto Velho (2), A.M.N.H. Nos. 22244, 22245. *Amapá* (*AP*): Oiapoque (1), C.G. No. 1443. *Pará* (*PA*): M.C.Z. No. 5538. Monte Alegre (1), Vanzolini (1955). Piratuba (2), Vanzolini (1955). Marajo Island (3), Procter (1923); *B.M. No. 1923.11.9.89. Alto Río Capim (4), Goeldi (1902). *Río Grande do Norte* (*RN*): Lake Papery (1), Schmidt (1936), Schmidt and Inger (1951); C.A.S. No. 49535. Extremoz (1), Schmidt (1936), Schmidt and Inger (1951). *Paraíba* (*PB*): Areia (1), Amaral (1934). Alagoa do Monteiro (= Monteiro) (2), Amaral (1935, 1937b), Vanzolini (1955). *Pernambuco* (*PE*): Boulenger (1885); *B.M. No. 81.1.17.9, 81.1.17.10. Poção (1), Vanzolini (1955). *Alagoas* (*AL*): Maceio (1), Vanzolini (1955, MS). *Sergipe* (*SE*): Maroim (1), Reinhardt and Lütken (1861). *Bahía* (*BA*): Vanzolini (1955, MS); I.R.Sc.N.B. (2); V.M. No. 12327. Barreiras (1), *U.M.M.Z. No. 103065. Santa Rita (2), V.M. No. 22. São Salvador (3), Duméril and Bibron (1839), Duméril (1851), Strauch (1881); A.M.N.H. No. 61241; K.U.M.N.H. No. 29426. Río Belmonte (4), Strauch (1881), Wagler (1883), Wied (1825a, 1825b). Cotinguiba (6), K.M. No. 4420. Río Mucurí (5), Strauch (1881), Wagler (1833), Wied (1825a, 1825b); A.M.N.H. No. 1097 (lectotype of *flavescens*). *Espiríto Santo* (*ES*): K.M. No. 4421. Porto Cachoeiro (1), Vanzolini (1955, MS). *Minas Gerais* (*MG*): Between Rio das Velhas and Rio San Francisco (1), Reinhardt and Lütken (1861). Lagoa Santa (2), Lütken (1892), Vanzolini (1955). Pirapora (3), *U.M.M.Z. Nos. 103066, 103067. *Rio de Janeiro* (*RJ*): Engmann (1926). *São Paulo* (*SP*): Vanzolini (1955, MS); M.C.Z. Nos. 20652–20654, 27678, 27679. ?Agua Vermelha, Vanzolini (1955). ?Bocaina, Vanzolini (1955). ?Cardoso de Almeida, Vanzolini (1955). ?Cotia, Vanzolini (1955). ?Serra da Bocaina, Vanzolini (1955). ?Tabapuan, Vanzolini (1955). Guaratinguetá (1), Vanzolini (1955). São José dos Campos (2), Vanzolini (1955). Santos (3), H. von Ihering (1898), Vanzolini (1955). Raiz da Serra (4), H. von Ihering (1898). Serra d'Agua (5), Vanzolini (1955). São Paulo (6), Vanzolini (1955, MS). Campo Limpo (6), Vanzolini (1955). Eleutério (7), Vanzolini (1955). Cascata (8), Vanzolini (1955). Barueri (9), C.G. Nos. 1331, 1332. São João de Boa Vista (10), Vanzolini (1955). São José do Rio Pardo (11), Vanzolini (1955). Pedreira (12), Vanzolini (1955). Emas (13), Vanzolini (1948, 1955, MS). Mogí Mirim (14), Vanzolini (1955). Pirapora (15), Vanzolini (1955). Campinas (16), M.S.N.G. No. 32251. Quilombo (17), Vanzolini (1955). Mairinque (18), Vanzolini (1955). Franca (19), Vanzolini (1955, MS). Palmeiras (20), Vanzolini (1955). Loreto (21), Vanzolini (1955). Salto (22), Vanzolini (1955). Remanso (23), Vanzolini (1955). Cordeirópolis (24), Vanzolini (1955). Luiz Antonio (25), Vanzolini (1955). Itapé (26), Vanzolini (1955). Boituva (27), Vanzolini (1955). Tatuí (28), Vanzolini (1955). Mattao (29), Vanzolini (1955). Java (30), Vanzolini (1955). Dois Corregos (31), Vanzolini (1955). Engenheiro Hermilo (32), Vanzolini (1955). São Manoel (33), Vanzolini (1955). Barretos (34), Vanzolini (1955). Continental (35), Vanzolini (1955). Macedônia (36), Vanzolini (1955). Guaianaz (37), Vanzolini (1955). Avaré (38), Vanzolini (1955). Borbonema (39), Vanzolini (1955). Batalha (40), Vanzolini (1955). Cerqueira Cesar (41), Vanzolini (1955). Guarantã (42), Vanzolini (1955). Valparaiso (43), Vanzolini (1955). Aguapeí (44), Vanzolini (1955). *Paraná* (*PR*): Vanzolini (1955). *Santa Catarina* (*SC*): Joinville, Vanzolini

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